DATA REVIEW WORKSHEETS

Type of validation Full:___ __ Project Number:__400-59382-1_____
Limited:___X__ Date:___09/14/2011_____

REVIEW OF INORGANIC ANALYSIS DATA PACKAGE

The following guidelines for evaluating metals analyses (6010B/7000A series method) sulfide, and/or cyanide were created to delineate required validation actions. This document will assist the reviewer in using professional judgment to make more informed decision and in better serving the needs of the data users. The sample results were assessed according to USEPA data validation guidance documents in the following order of precedence: *USEPA Contract Laboratory program National Functional Guidelines for Inorganic data Review (OSWER 9240.1-45, EPA 540-R-04-004, October 2004- Final). Validation of Metal for the Contract Laboratory Program (CLP) (SOP HW-2, Revision 13. Based on ILM05.3 (August 2009).* Quality control validation criteria were derived from *"Test Methods for Evaluating Solid Waste, Physical/Chemical Methods SW-846 (Final Update IV, 1998)".* The project QAPP is reviewed for project specific information (if available). The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance document, unless otherwise noted.

The hardcopied (laboratory name) _Test_America_____ data package received has been reviewed and the quality control and performance data summarized. The data review for inorganic included:

Lab. Project/SDG No.: ____400-59382-1_____ Sample matrix: _Soil_____
No. of Samples: __12_____
Field blank No.: _____-_____
Equipment blank No.: _____-_____
Field duplicate No.: _____

___X___ Data deliverables
___X___ Holding Times
__N/A__ Calibrations
___X___ Blanks
__N/A__ ICP Interference Check Results
___X___ Matrix Spike/Matrix Spike Duplicate
___X___ Laboratory Duplicates
___X___ Field Duplicates
___X___ Laboratory Control Samples
__N/A__ ICP Serial Dilution Results
__N/A__ Detection Limits Results
__N/A__ Sample Quantitation

Overall Comments: ___Metals_modified_skinner_list_(SW846-6010B;_Hg_SW846_7471A;____ hexavalent_chromium_(SW846-7196A)_Cyanide_(SW846-9014)_____
_____
_____
_____
_____
_____

Definition of Qualifiers:

J- Estimated results
U- Compound not detected
R- Rejected data
UJ- Estimated non-detect
E- Laboratory qualifier

Reviewer:_____ Date:__04/15/2012_____

All criteria were met __X____
Criteria were not met
and/or see below _____

I. DATA DELIVERABLES

A. Data Package:

MISSING INFORMATION	DATE LAB. CONTACTED	DATE RECEIVED

B. Other Discrepancies:

All criteria were met __X___
Criteria were not met
and/or see below _____

HOLDING TIMES
The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of preparation, and subsequently from the time of preparation to the time of analysis.

Complete table for all samples and circle the analysis date for samples not within criteria

SAMPLE ID	DATE SAMPLED	CYANIDE DATE ANALYSIS	Hg DATE ANALYSIS	OTHERS DATE ANALYSIS	pH	SULFIDE	ACTION
ALL SAMPLES DIGESTED AND ANALYZED WITHIN THE METHOD RECOMMENDED HOLDING TIME							

Criteria

Metals – 180 days from time of collection.
Mercury – 28 days from time of collection.
Hexavalent Chromium (solids)- 30/7 from day of collection
Cyanide – 14 days from time of collection
Sulfide - 14 days from time of collection
pH measurements of aqueous samples upon receipt at the laboratory (criteria pH $\leq$ 2 for metals; pH $\geq$ 12 for cyanide)

Actions: Qualify positive results/nondetects as follows:

If holding times are exceeded, estimate positive results (J) and rejects nondetects (R).
If pH > 2 for metals or pH < 12 for cyanide, positive results (J) and nondetects (UJ).
Cooler Temperature (Criteria: 4^{o}C + 2^{o}C):___3.2^{o}C_____.
If cooler temperature is > 10^{o}C, flag non-detects as (UJ) and detects as (J).

All criteria were met __N/A___
Criteria were not met
and/or see below _____

INSTRUMENT CALIBRATION (SECTION 1)

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data. Minimum of 2 calibration points for ICP-AES and ICP-MS; 5 points for Hg; and 4 points for cyanide. One initial calibration standard at the CRQL level for cyanide and Hg. If no, write in the non-compliance section of the data review narrative.

List the analytes which did not meet the percent recovery (%R) criteria for Initial or Continuing Calibration Verification standards (ICV or CCV).

Acceptance Criteria	ICV %R	CCV %R
Metals by 6010B	100 + 10%	100 + 10%
Mercury/Metals by 7000s	100 + 10%	100 + 20%
Cyanide	100 + 15%	100 + 15%
Sulfide	100 + 15%	100 + 15%

DATE	ICV/CCV#	ANALYTE	%R	ACTION	SAMPLES AFFECTED
NOTE: LABORATORY INFORMED NO QUALITY ISSUES INITIAL AND CONTINUING CALIBRATION MEET METHOD SPECIFIC CRITERIA					

ACTIONS: If any analyte does not meet the %R criteria, follow the actions stated below. Qualify five samples on either side of the ICV/CCV out of control limit.

Estimate positive results (J) if:	ICV	CCV
Metals by 6010B	111 – 125%	111 – 125%
Mercury/Metals by 7000s	111 – 125%	111 – 135%
Cyanide	116 – 130%	116 – 130%
Sulfide	116 – 130%	116 – 130%

Estimate positive results and nondetects (U/UJ) if:		
Metals by 6010B	75 – 89%	75 – 89%
Mercury/Metals by 7000s	75 – 89%	65 – 79%
Cyanide	70 – 84%	70 – 84%
Sulfide	70 – 84%	70 – 84%

Reject positive results and nondetects (R) if:		
Metals by 6010B	<75%, >125%	<75%, >125%
Mercury/Metals by 7000s	<75%, >125%	<65%, >135%
Cyanide	<70%, >130%	<70%, >130%
Sulfide	<70%, >130%	<70%, >130%

All criteria were met __N/A___
Criteria were not met
and/or see below _____

III. INSTRUMENT CALIBRATIONS (SECTIONS 2 & 3)

2. Analytical Sequence

Did the laboratory use the proper number of standards for calibration as described in the method? Yes or No N/A

B. Were calibrations performed at the beginning of each analysis? Yes or No N/A

Were calibration verification standards analyzed at the beginning of sample analysis and the proper frequency according to the method? Yes or No N/A

D. Where the AA correlation coefficients (r) for the calibration curves $\geq$ 0.995? If r < 0.995, estimate positive results and nondetects (J/UJ). It is not necessary to qualify results if the laboratory used order regression. Yes or No N/A

Data quality may be affected if any of the above answer are "no". Use professional judgment to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the sample affected.

_____
_____
_____
_____

3. Other Check Standards

Laboratories may analyze an additional check standard after establishing the calibration curve. This standard may contain low level concentrations of target analytes and be analyzed and evaluated by the laboratory similar to a CLP "CRLD" standard (CRI for ICP, CRA for AA, and/or mid-range standard for CN and Sulfide). A 100 $\pm$ 20% recovery acceptance limit should be used by the validator to evaluate the standard.

ACTIONS: If any analyte does not meet the %R criteria, follow the action needed below. Qualify 50% of either side of the CRI/CRA out of control limits.

% R	%R < 50%	%R = 50-79%	%R = 121-150%	%R > 150%	Affected Range
Qualify Positive/Nondetects Results					
Metals by 6010B	R/R	J/UJ	J/A	R/A	<2x CRI conc.
Hg/metals by 7000s	R/R	J/UJ	J/A	R/A	<1.5x CRI conc.
Cyanide	R/R	J/UJ	J/A	R/A	<1.5x mid std. conc.
Sulfide	R/R	J/UJ	J/A	R/A	<1.5x mid std. conc.

CRI is not required for Al, Ba, Ca, Fe, Mg, Na, and K.

NOTE: No CRLD standard information included with data package. Laboratory informed no quality issues.

All criteria were met __X___
Criteria were not met
and/or see below _____

IV. BLANK ANALYSIS RESULTS (Sections 1 & 2)

The assessment of the blank analysis results is to determine the existence and magnitude of contamination problems. The criteria for evaluation of blanks apply only to blanks associated with the samples, including equipment, field, and laboratory blanks. If problems with any blanks exist, all data associated with the case must be carefully evaluated to determine whether or not there is an inherent variability in the data for the case, or if the problem is an isolated occurrence not affecting other data.

List the contamination in Sections 1 & 2 below. A separate worksheet page should be used for soil and water blanks.

Laboratory blanks Matrix:___Solid_____

DATE ANALYZED	**ICB/CCB#**	**PREP BLK**	**ANALYTE**	**CONCENTRATION UNITS**
_____	_____	_____	_____	_____
__No_analyte_detected_in_method_blanks._When_a_metal_was_found_in_the_blank_and_in_a_sample_the_laboratory_qulified_the_results_(B)_____				
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

Field/Equipment Matrix:_____

DATE ANALYZED	**EQUIPMENT/FIELD BLANK**	**ANALYTE**	**CONCENTRATION UNITS**
__No_field/equipment_blanks_analyzed_as_part_of_this_data_package_____			_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

All criteria were met __N/A___
Criteria were not met
and/or see below _____

IV. BLANK ANALYSIS RESULTS (Section 3)

Frequency requirements

Was the preparation blank analyzed for each matrix,
at the frequency of the method? Yes or No N/A
If no, estimate positive results < 10x IDL for which preparation blank was not analyzed.
If more than 20 samples/batch, qualification begins at the 21st sample.

B. Was an ICB analyzed? Yes or No N/A

C. Was a CCB analyzed at the frequency stated in the method? Yes or No N/A

Data quality may be affected if any of the above answer is “no”. Use professional judgment to determine the severity of the effect and qualify the data accordingly. Discuss any actions below, and list the samples affected.

_____
_____
_____
_____
_____
_____

NOTE FOR SOIL SAMPLES
Compare raw sample value with blank results in ug/L unit, or
Convert blanks analyzed during a soil case to mg/Kg in order to compare them with the sample results.

Conc. In ug/L x [Volume diluted to (mL)]/[Weight digested] x 1L/1000mL x 1000g/1Kg x 1mg/1000□g = concentration in wet weight (mg/Kg)

Concentration, dry weight (mg/Kg) = (Wet weight concentration)/(% Solids) x 100

ll criteria were met __N/A___
Criteria were not met
and/or see below _____

BLANK ANALYSIS RESULTS (Sections 4,5)

Laboratory blanks (PB, ICB/CCB) must first be used to qualify field and/or equipment blanks and samples.
Any contamination remaining in the field or equipment blank will be used to qualify the associated samples.

4. Initial/Continuing Calibration Blanks (ICB/CCB) Actions

Are all ICB/CCBs less than the SQL? Yes or No N/A

If no, qualify five samples on either side of the ICB/CCB out of control limits.
Estimate positive results (J) ≤ the ICB/CCB value.

ICB/CCB#	ANALYTE	CONC/UNITS	SAMPLES AFFECTED
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

5. Preparation Blanks (PB) Actions

Are the PB less than the SQL? Yes or No N/A

If no, reject positive results (R) < 10x the PB value.

PB	ANALYTE	CONC/UNITS	SAMPLES AFFECTED
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

.
Are the PB less than the SQL? Yes or No N/A

If yes, reject all results (R) < 10x the PB value.

PB	ANALYTE	CONC/UNITS	SAMPLES AFFECTED
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

All criteria were met __N/A___
Criteria were not met
and/or see below _____

BLANK ANALYSIS RESULTS (Section 6)

6. Field/Equipment Blank (FB/EB) Actions

Are the FB/EB less than the SQL? Yes or No N/A

If no, was the FB/EB value already rejected due to other QC criteria? Yes or No

If no, reject (R) positive results < 5x the FB/EB value. Reject soil data with raw digest results < 5x the FB/EB value

PB	ANALYTE	CONC/UNITS	SAMPLES AFFECTED
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

All criteria were met __N/A___
Criteria were not met
and/or see below _____

INDUCTIVELY COUPLED PLASMA (ICP) INTERFERENCE CHECK SAMPLE

The assessment of the ICP interference check sample (ICS) is to verify the laboratory's interelement and background correction factors.

1. Recovery Criteria

List any elements in the ICS AB and ICS A solutions which did not meet the %R criteria (80 – 120 %).

DATE ELEMENT %R ACTION SAMPLES AFFECTED

_____ _____ _____ _____
_The_laboratory_informed_no_quality_issues._Interelement_check_sample_meet_method_____
specific_criteria _____ _____ _____
_____ _____ _____ _____

ACTIONS:

If an element does not meet the %R criteria, follow the actions stated below

% R	%R < 50%	%R = 50-79%	%R = 121-150%	%R > 150%
Qualify Positive/Nondetects Results				
Metals by 6010B	R/R	J/UJ	J/A	R/A

2. Frequency requirements

Were interference QC samples run at the frequency stated in the method (beginning of the analytical run)? Yes or No N/A
If no,
ACTIONS: Estimate positive results (J) all samples for which Al, Ca, Fe, Mg > ICS value.

The data may be affected. Use professional judgment to determine the severity of the effect and qualify the data accordingly. Discuss any actions below and list the samples affected.

_____
_____
_____
_____
_____
_____
_____
_____
_____

All criteria were met _____
Criteria were not met
and/or see below __X___

VI. MATRIX SPIKE (MS)

Sample # _400-59382-1MS/-1MSD_____ Matrix:_SOIL_____ Units: ___ug/Kg___

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. Note that for Region 2, MS not required for: Ca, Mg, K, and Na for aqueous matrix.

Al, Ca, Fe, Mg, K, Na, for soil matrix

MS Recovery Criteria. List the percent recoveries for analytes which did not meet the %R criteria (75 – 125%); (85 – 115 % FOR Cr (VI)).

ANALYTE	SPIKE SAMPLE RESULT (SSR)	SAMPLE RESULT (SR)	SPIKE ADDED	% R	ACTION
MS					
Mn	1270000	900000	115000	316	No action
Sb	27800	1100 J	115000	24	Qualify results (J)
MSD					
Mn	956000	900000	111000	46	No action
Sb	27500	1100 J	111000	25	Qualify results (J)

ACTIONS: Matrix spike actions apply to all samples of the same matrix. The qualification will also be applied to the results of all samples within a given area of the site, if deemed appropriate.

If the sample results $\geq$ 4x the spike concentration, no action is taken.
If any analyte does not meet the %R criteria, follow the actions stated below.

Aqueous Samples	%R < 30%	%R = 30-74%	%R = 126-150%	%R > 150%
Qualify Positive/Nondetects Results				
Affected Analyte	R/R	J/UJ	J/A	R/A

Soil Samples	%R < 10%	%R = 10-74%	%R = 126-200%	%R > 200%
Qualify Positive/Nondetects Results				
Affected Analyte	R/R	J/UJ	J/A	R/A

2. Frequency Criteria

A. Was a matrix spike prepared at the frequency stated in the method (1/20)? **Yes** or No

If no, estimate positive results (J) for which analyte was not spiked.
If more than 20 samples/batch, qualification begins at the 21st sample.

B. Was a field blank used as spiked sample? Yes or **No**

If yes, estimate positive results (J) < 4x spike level added for the analyte.

Note: No MS/MSD analyzed for Hg; LCS used to assess accuracy

A separate worksheet page should be used for each matrix spike

All criteria were met __X___
Criteria were not met
and/or see below _____

VI. MATRIX SPIKE (MS)

Sample # _400-59382-10MS/-10MSD_____ Matrix:_SOIL_____ Units: ___ug/Kg___

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. Note that for Region 2, MS not required for: Ca, Mg, K, and Na for aqueous matrix.

Al, Ca, Fe, Mg, K, Na, for soil matrix

MS Recovery Criteria. List the percent recoveries for analytes which did not meet the %R criteria (75 – 125%); (85 – 115 % FOR Cr (VI)).

ANALYTE	SPIKE SAMPLE RESULT (SSR)	SAMPLE RESULT (SR)	SPIKE ADDED	% R	ACTION
MS/MSD recoveries and RPD within laboratory and generally acceptable control limits for hexavalent chromium and mercury.					

ACTIONS: Matrix spike actions apply to all samples of the same matrix. The qualification will also be applied to the results of all samples within a given area of the site, if deemed appropriate.

If the sample results $\geq$ 4x the spike concentration, no action is taken.
If any analyte does not meet the %R criteria, follow the actions stated below.

Aqueous Samples	%R < 30%	%R = 30-74%	%R = 126-150%	%R > 150%
Qualify Positive/Nondetects Results				
Affected Analyte	R/R	J/UJ	J/A	R/A

Soil Samples	%R < 10%	%R = 10-74%	%R = 126-200%	%R > 200%
Qualify Positive/Nondetects Results				
Affected Analyte	R/R	J/UJ	J/A	R/A

2. Frequency Criteria

A. Was a matrix spike prepared at the frequency stated in the method (1/20)? **Yes** or No

If no, estimate positive results (J) for which analyte was not spiked.
If more than 20 samples/batch, qualification begins at the 21st sample.

B. Was a field blank used as spiked sample? Yes or **No**

If yes, estimate positive results (J) < 4x spike level added for the analyte.

Note: No MS/MSD analyzed for cyanide; LCS used to assess accuracy

A separate worksheet page should be used for each matrix spike

All criteria were met __N/A___
Criteria were not met
and/or see below _____

VII. FIELD DUPLICATES

Sample #:_____ Matrix:_____ Units:__ug/Kg_

Field duplicate samples may be taken and analyzed as an indication of overall precision. Field duplicate analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measure only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

List the concentrations and RPDs in the field duplicate pair. RPD criteria: ± 20% for aqueous; ± 35% for soil. For soil duplicates, if the % solids for the sample and its duplicate differ by more than 1%, report concentrations in ug/L and calculate RPD or difference for each analyte.

ANALYTE	SQL ug/L	SQL ug/Kg	SAMPLE RESULTS	DUPLICATE RESULTS	RPD	ACTION
Al						
Sb						
As						
Ba						
Be						
Cd						
Ca						
Cr	No field laboratory duplicates analyzed for this data package for metals. MS/MSD recoveries used to assess precision. RPD within laboratory and generally acceptable control limits					
Co						
Cu						
Fe						
Pb						
Mg						
Mn						
Hg						
Ni						
K						
Se						
Ag						
Na						
Tl						
V						
Zn						
Cyanide						
Cr(VI)						

Field duplicate actions should be applied to only the sample and its duplicate.

All criteria were met __N/A___
Criteria were not met
and/or see below _____

Actions: Indicates which criterion was used to evaluate precision by circling either the RPD or SQL for each element. If both sample and duplicate are nondetects, the RPD is not calculated (NC), no action is needed.

For waters: If RPD > 20% but < 100% then estimate detects and non-detects (J/UJ). If RPD > 100% rejects all data (results > CRQL)
For soils: If RPD > 35 but < 120% then estimate detects and non-detects (J/UJ). If RPD > 120% rejects all data (results > CRQL)
For waters: If absolute difference is ≥ 2x CRQL then rejects (R) detects and non-detects.
For soil: If absolute difference is ≥ 4x CRQL then rejects (R) detects and non-detects.

A separate worksheet page should be used for each laboratory duplicate analysis

All criteria were met _X____
Criteria were not met
and/or see below _____

VIII. LABORATORY DUPLICATES (Section 1)

Laboratory run duplicates samples to verify laboratory consistency and precision. They are a measure of laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

1. Difference Criteria

List the concentrations of any analyte not meeting the RPD criteria (± 20% for aqueous; ± 35% for soil). For soil duplicates, if the % solids for the sample and its duplicate differ by more than 1%, report concentrations in □g/L and calculate RPD or difference for each analyte.

Sample #:___400-59382-3_____Matrix:_____ Units:___ug/Kg_____

ANALYTE	SQL ug/L	SQL mg/Kg	SAMPLE RESULTS	DUPLICATE RESULTS	RPD	ACTION
Al						
Sb						
As						
Ba						
Be						
Cd						
Ca						
Cr						
Co						
Cu						
Fe						
Pb						
Mg						
Mn						
Hg						
Ni						
K						
Se						
Ag						
Na						
Tl						
V						
Zn						
Cyanide	RPD within laboratory and generally acceptable control limits					
Sulfide						

Laboratory duplicates actions should be applied to all other samples of the same matrix type. This qualification will also be applied to the results of all samples within a given area of the site, if deemed appropriate.

All criteria were met __X___
Criteria were not met
and/or see below _____

Actions: Indicates which criterion was used to evaluate precision by circling either the RPD or SQL for each element. If both sample and duplicate are non-detects, the RPD is not calculated (NC), no action is needed.

For aqueous, RPD > 20% but < 100% flag (J) estimated the associated sample data > CRQL. If RPD > 100% reject ® associated sample data.
For soil, RPD > 35% but < 120% flag (J) estimated the associated sample data > CRQL. If RPD > 120% reject ® associated sample data.
For waters: If absolute difference is ≥ 2x CRQL then rejects (R) detects and non-detects.
For soil: If absolute difference is ≥ 4x CRQL then rejects (R) detects and non-detects.
Estimate (J) all > CRDL if no laboratory duplicate was analyzed.

2. Frequency Criteria

A. Was a laboratory duplicate prepared at the frequency stated in the method (1/20)? Yes or No

If no, estimate positive results (J) for the analyte which duplicate was not performed. If more than 20 samples/batch, qualification begins at the 21st sample.

B. Was a field blank used for laboratory duplicate analysis? Yes or **No**

If yes, estimate positive results (J) for the analyte if field blank was used for duplicate analysis.

All criteria were met __X___
Criteria were not met
and/or see below _____

IX. LABORATORY CONTROL SAMPLE (LCS/LCSD)

The assessment of the LCSs is to determine both intralaboratory contamination and matrix specific precision and accuracy. Note that for Region 2, LCS is not required for aqueous Hg and Cyanide.

LCS Recoveries Criteria

A. Aqueous LCS

List any LCS recoveries not within %R criteria (80 – 120%) and the samples affected.

DATE ELEMENT % R ACTION SAMPLES AFFECTED

_____
_____
_____
_____
_____
_____
_____

ACTIONS: If analyte does not meet the %R criteria, follow the actions stated below:

Aqueous LCS	% R < 50%	% R = 50 – 79%	% R = 121 – 150%	% R > 150%
Qualify Positive/Nondetects Results				
Affected Analyte	R/R	J/UJ	J	R

B. Solid LCS

List any analytes that were not control window set by EPA or provided by the vendor.

ELEMENT LCS CONC. CONTROL WINDOW ACTION SAMPLES AFFECTED

___Recoveries_within_laboratory_control_limits_____

_____

_____

_____

_____

All criteria were met __X___
Criteria were not met
and/or see below _____

ACTIONS: If any analyte was outside the control window, follow the actions stated below:

Soil LCS	< Lower Control Limit	> Upper Control Limit
Qualify Positive/Nondetects Results		
Affected Analyte	J/UJ	J

2. Frequency Criteria

A. Was a laboratory control sample prepared at the frequency stated in the method (1/20)? **Yes** or No

If no, estimate positive results (J) for the analyte if LCS was not performed.

If more than 20 samples/batch, qualification begins at the 21st sample.

All criteria were met __N/A___
Criteria were not met
and/or see below _____

X. ICP SERIAL DILUTION ANALYSIS (Section 1)

The assessment of the ICP serial dilution analysis is to determine the precision of the laboratory through a 5x dilution.

1. Percent Difference (%D) Criteria:

__N/A___ Serial dilutions were performed for each matrix and results for the diluted samples analysis agreed within 10% of the undiluted analysis for the analyte concentrations ≤ 50x MDL.

_____ Serial dilutions were not performed for the following target analytes: _____

_____ Serial dilutions were performed, but analytical results did not agree within 10% difference for analyte concentrations > 10x IDL before dilution.

List the %Ds for analytes which did not meet the %D criteria (10%/100%)

Sample # _____ Matrix:_____ Units:_____

ANALYTE	IDL	50x IDL	SAMPLE RESULTS	SERIAL DILUTION	%D	ACTION
Al						
Sb						
As						
Ba						
Be						
Cd						
Ca						
Cr						
Co						
Cu						
Fe						
Pb						
Mg						
Mn						
Hg						
Ni						
K						
Se						
Ag						
Na						
Tl						
V						
Zn						

Note: The laboratory noted no quality issues.

All criteria were met __N/A___
Criteria were not met
and/or see below _____

ACTIONS: Actions apply to all samples of the same matrix. The qualification will also be applied to the results of all samples within a given area of the site, if deemed appropriate. Qualify only samples with raw results > 50x MDL.

Flag results with an (E) for elements exhibiting %D > 10%.
Estimate (J) positive results > 50x MDL for elements that exhibited %D > 10 but < 100.

Reject (R) positive results > 50x MDL for elements which exhibited %D $\geq$ 100%.

SERIAL DILUTION ANALYSIS (Section 2)

2. Frequency Criteria

A. Was a serial dilution analysis prepared as required by the method? Yes or No

If no, estimate positive results $\geq$ 50x MDL (J) for the analyte which serial dilution analysis was not performed.

B. Was a field blank used for serial dilution analysis? Yes or No

If yes, estimate positive results $\geq$ 50x MDL (J) for the analyte if field blank was used for serial dilution analysis.

Note: the laboratory noted no quality issues

A separate worksheet page should be used for each serial dilution analysis.

All criteria were met __X___
Criteria were not met
and/or see below _____

XI. DETECTION LIMITS RESULTS

The detection limit assessment is to verify that samples results are within instrument calibration range or linear range (ICP).

Instrument Detection Limits (IDL). Note IDL is not required for Cyanide.

A. IDL/MDL (or lowest quantitation limit used) results were present and found to be al levels that meet the project objectives? Yes or No

B. IDL/MDL (or lowest quantitation limit used) were not met for the following elements:_____

2. Reporting Requirements

A. Were sample results on Form I (or equivalent) reported down to the IDL/MDL or lowest quantitation limit used for all analytes? Yes or No

B. Were sample weights, volumes, and dilutions taken into account when reporting results (positive and nondetects)? **Yes** or No

If no, the reported results may be inaccurate. Request the laboratory resubmit the corrected data.

3. Sediment Sample Percent Solids (% solids):

A. Were the % solids for any sediment samples < 50% but ≥ 10%? Yes or No
If yes, estimate positive results and nondetects (J/UJ) if the % solids is 10-50%. List the affected samples:___N/A_____

B. Were the % solids for any sediment samples < 10%? Yes or No
If yes, reject all results (R) if the % solid is < 10%. List the affected samples:___N/A_____

XI. TOTAL/DISSOLVED OR INORGANIC/TOTAL ANALYTES

A. Were any analyses performed for dissolved as well as total analytes on the same sample(s)? Yes or **No**

B. Were any analyses performed for inorganic as well as total analytes on the same sample(s)? Yes or **No**

If yes, compare the differences between dissolved (or inorganic) and total analyte concentrations. Compute each difference as a percent of the total analyte only when both of the following conditions are fulfilled:

(1) The dissolved (or inorganic) concentration is greater than total concentration, and
(2) greater than or equal to 5xMDL.

All criteria were met __X___
Criteria were not met
and/or see below _____

C. Is any dissolved (or inorganic) concentration greater than its total concentration by more than 20%? Yes or No

D. Is any dissolved (or inorganic) concentration greater than its total concentration by more than 50%? Yes or No

ACTION:
If the percent difference is greater than 20%, flag (J) both dissolved/inorganic and total concentrations as estimated. If the difference is more than 50%, reject (R) both the values.

XII. SAMPLE QUANTITATION

The sample quantitation evaluation is to verify laboratory quantitation results.

__X___ Sample results fall within the linear range for ICP and within the calibration range for all other parameters.

_____ If samples results were beyond the linear range/calibration range of the instrument, were dilution performed?
If no, estimate results (J).
List the affected samples/elements/dilution:
_____
_____

In the space below, please show a minimum of one sample calculation per method:

ICP

Hg/Metals by AA

Hexavalent Chromium

Cyanide

Others

For soil samples, the following equation may be necessary to convert raw data values reported in □g/L to actual sample concentrations (mg/Kg):

$$\text{Conc. in } \square\text{g/L} \times \frac{\text{Volume diluted to, mL}}{\text{Weight digested, g}} \times \frac{1\text{L}}{1000\text{ mL}} \times \frac{1000\text{ g}}{1\text{ Kg}} \times \frac{1\text{ mg}}{1000\text{ mg}} = \text{concentration in wet weight mg/Kg}$$

In addition the sample results are converted to dry weight by using the percent solid calculations:

$$\frac{\text{Wet weight concentration}}{\%\text{ solids}} \times 100 = \text{final concentration, dry weight (mg/Kg)}$$